

Back Pressure Regulators Manual Adjusted and Dome-loaded

Index	
PVRB Series	1
BP-3 Series	3
BP-60 Series	5
BPR30 Series	7
BP-66 Series	9
BPR21 Series	11



Circle Seal Controls

PVRB Series

Ultra-sensitive Back Pressure Regulator Inlet & Outlet to 60 psig



Index PVRB Series 1 BP-3 Series 3 BP-60 Series 5 BPR30 Series 7 BP-66 Series 9 BPR21 Series 11

Features

Low pressure control

- Full range capability
- Compatible with corrosive and non-corrosive gases & liquids
- Ultra-sensitive pressure regulator

Applications

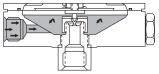
- Chromatography
- Process stream sampling
- Bubbling operations
- Medical instrumentation
- Research laboratories
- Instrument calibration

Technical Data

Body Construction Material	Polyvinyl chloride	
Spring Housing Materials	PVRB2 & PVRB3: Polyvinyl chloride	
	PVRB4 & PVRB5: Aluminum alloy	
Seat Material	Kel-F®	
Diaphragm Material	PTFE	
Adjustment Screw Material	Delrin®	
Port Sizes	1/4" NPT female	
Pressure Ratings	Maximum control pressure: 60 psig (4 BAR)	
Temperature Range	0° F to +125° F (-18° C to +52° C)	
Flow Capacity	Cv = 0.011 maximum	
	Orifice diameter = 0.025"	
Weight	PVRB2 & PVRB3: 14 oz	
	PVRB4 & PVRB5: 1.5 lbs	
Leakage	Bubble-tight	
Sensitivity	Less than ½ psi	

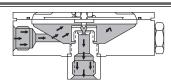
Note: Proper filtration is recommended to prevent damage to sealing surfaces.

How it Works



Closed

With the unit spring load adjusted to the desired regulated "set" pressure, a deadtight seal is affected against the applied upstream pressure.



Regulating

When the upstream process pressure (applied on the diaphragm) increases, an opposing force is generated which, through the diaphragm plate, acts against the "set" spring load.

As the increasing upstream pressure level reaches the "set" pressure, the poppet is gradually lifted off its seat. A consequent decrease in upstream pressure is experienced when the flowing fluid is relieved to the downstream side of the process at a faster rate than the upstream pressure can supply.

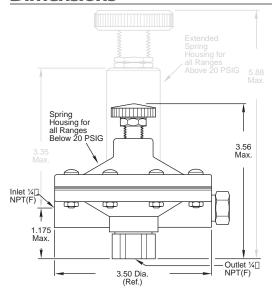
With decreasing upstream pressure, the spring force starts the poppet moving toward its closed position, thus maintaining the desired "set" pressure level within a narrow band.

When the upstream pressure has decreased to a level just below "crack", the adjusting spring load again creates a tight seal between the poppet and the sharp edge of the valve seat.

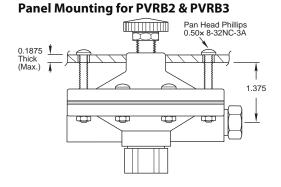
Circle Seal Controls

BP-3 Series

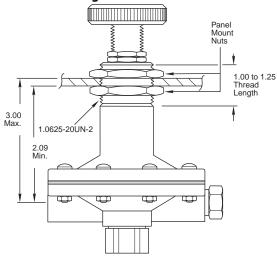
Dimensions



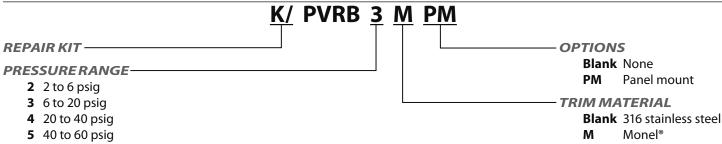
0.172 Dia. on a 3∏Dia. B.C. 3 Places 67½* 22½* Hole to Clear 1.125 Dia. Knob



Panel Mounting for PVRB4 & PVRB5



How to Order



 $Note: if this \ regulator \ is \ to \ be \ used \ in \ oxygen \ service, specify \ "GENERAL \ OXYGEN \ SERVICE" \ when \ ordering \ or \ furnish \ the \ factory \ a \ copy \ of \ the \ special \ requirements.$

Please consult your Circle Seal Controls distributor, representative, or the factory for information on special connections, operating pressures and temperature ranges.

For Your Safety

It is solely the responsibility of the system designer and user to select products suitable for their specific application requirements and to ensure proper installation, operation, and maintenance of these products. Material compatibility, product ratings and application details should be considered in the selection. Improper selection or use of products described herein can cause personal injury or property damage.

Kel-F° is a registered trademark of 3M Company. Delrin° is a registered trademark of DuPont. Monel° is a registered trademark of Special Metals Corporation.

BP-3 Series*

Adjustable Back Pressure Regulators



The BP-3 Series is designed for either liquid or gas service in instrumentation systems. Similar in design to pressure reducing control regulators which regulate outlet pressures, back pressure regulators control the inlet pressure. The many features of this regulator, particularly its precise throttling action, make it ideal for this type of application. In low flow or closed systems, overpressures often are released by pressure relief valves. This type of relief is on-off with no throttling control. In contrast to relief valves, the back pressure control regulator with is throttling action substantially improves system pressure regulation.

* Replaces the BPR7A and BPR8A Series.

Applications

- Analytical instrumentation
- Pilot plants
- Specialty gas systems
- Compressors
- · Pump bypass
- · Process vessel protection

Features & Specifications

- Only 316L stainless steel and PTFE in flow stream
- 316L stainless steel construction
- Operating temperatures of -40° F to +500° F (-40° C to +260° C)
- · Bubble-tight shutoff
- Gas or liquid service
- Adjustable pressure control ranges of 0–6 psig,
 0–10 psig, 0–25 psig, 0–50 psig, 0–100 psig,
 0–250 psig, 0–500 psig, 0–750 psig, and 0–1,000 psig
- Cv flow coefficient is 0.2

Options

- Wetted materials of construction: brass, Monel®, Hastelloy®, titanium
- Extra ports
- Panel mount (requires a 1¾" mounting hole)
- High purity connections (tube stubs, metal face seals, etc.)
- Pressure gauges
- Optional Cv's: 0.03, 0.05, 0.06, 0.12, 0.24, 0.3, 0.095, 0.025, 0.04, 0.005, and 0.01

Maximum Temperature & Control Pressures

ı		Maximum		
1	Seat Material	Temperature	@	Maximum Control Range
	Viton®	250° F (121° C)	@	250 psig (1.72 MPa)
	Kalrez®	300° F (148° C)	@	250 psig (1.72 MPa)
	High-density PTFE	200° F (93° C)	@	500 psig (3.44 MPa)
	Polyimide	500° F (260° C)	@	1,000 psig (6.89 MPa)
	PEEK™	500° F (260° C)	@	1,000 psig (6.89 MPa)

Note: Temperatures in excess of 175° F (80° C) require the use of a metal knob or the tamper-proof option.

Circle Seal Controls

BP3 - 1 A 1 1 I 5 G 1 1 1 C

BODY MATERIALS-

- 1 316L stainless steel
- **2** Brass
- 4 Monel®
- 5 Hastelloy® B
- 6 Hastelloy® C
- **7** Titanium

PORT CONFIGURATION

A Standard (one inlet & one outlet port) For more port configurations, see page 13.

PROCESS PORT TYPES-

- 1 1/4" FNPT (1/4" FNPT gauge ports) (standard)
- 2 ¼" tube (¼" tube gauge ports)
- **3** ¼" sch 80 pipe (¼" FNPT gauge ports)
- 4 %" FNPT (1/4" FNPT gauge ports)
- **6** ½" tube (¼" tube gauge ports)
- **0** %" FNPT (%" FNPT gauge ports)
- **A** ¼" ISO 7-Rc taper internal (¼" FNPT gauge ports)
- **B** ¼" internal VCR (¼" tube gauge ports)
- **K** 1/4" sch 40 pipe (1/4" FNPT gauge ports)

SURFACE FINISH/DIAPHRAGM CAVITY

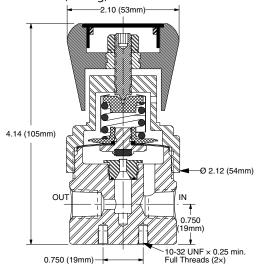
1 < 25 Ra

ACTUATOR MATERIALS

- **B** CF PTFE
- **C** Polyimide (metal knob is standard)
- **D** Viton®
- I High-density PTFE
- K Kalrez®
- Q PEEK™

Outline & Mounting Dimensions

Weight = 1.9 lbs (0.86 kg)



Tefzel® is a registered trademark of the DuPont Company.
Kalrez® and Viton® are registered trademarks of DuPont Dow Elastomers.
PEEK™ is a trademark of Victrex PLC.

Inconel® and Monel® are registered trademarks of Special Metals Corporation. Hastelloy® is a registered trademark of Haynes International, Inc. Kel-F® is a registered trademark of 3M Company.

CAP ASSEMBLY

- 1 Standard
- 4 Panel mount
- 8 Tamper-proof
- F Tamper-proof, panel mount
- **G** Metal knob
- H 1/4" FNPT dome-loaded
- L BP-6 top works, stainless steel
- **O** BP-6 top works, panel mount, stainless steel

DIAPHRAGM FACING/BACKING MATERIAL

- 1 PTFE/stainless steel
- 6 Tefzel® ring/stainless steel
- 7 Viton®/stainless steel
- 8 PTFE/Inconel®
- 9 PTFE/Hastellov® B
- O PTFE/Hastelloy® C
- A PTFE/tantalum

DIAPHRAGM TYPE

- 1 Standard diaphragm
- 4 Vacuum assist spring, standard diaphragm

CONTROL RANGE

- **B** 0–6 psig
- **C** 0–10 psig
- **D** 0-25 psig
- **E** 0−50 psig
- **G** 0–100 psig
- I 0−250 psig
- **J** 0–500 psig*
- **W** 0-750 psig*
- **K** 0-1,000 psig*†

FLOW COEFFICIENT (CV)

- 1 0.03
- **2** 0.05
- **3** 0.06
- **4** 0.12
- **5** 0.2 (standard)
- 6 0.24
- **7** 0.30
- **A** 0.095
- **C** 0.025
- **E** 0.04
- I 0.005
- **J** 0.01
- Polyimide, PEEK™, or Kel-F® actuators are recommended for these pressure ranges.
- † Must use BP-6 top works

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BP-60 Series*

High Pressure Back Pressure Regulator



The BP-60 Series is the counterpart of the PR-50 pressure reducing series for systems that are higher in pressure and low to moderate flows. This regulator has a diaphragm for maximum sensitivity in providing relief at high pressures. The PTFE stainless seat assembly provides good shutoff in most applications. For economy purposes, the cap assembly and knob are of aluminum construction as in the PR-50 companion unit. Good sensitivity and a wide selection of control ranges make this regulator an excellent selection in many research and pilot plant facilities.

* Replaces the BPR9A Series.

Applications

- Pilot plants
- Anayltical instrumentation
- Compressors
- Pump bypass
- Pressure vessel protection
- Hyrostatic testing

Features & Specifications

- Adjustable pressure control ranges of 0–500 psig, 0–1,000 psig and 0–2,000 psig
- 316L stainless steel or brass (alloy 360) body construction
- Designed for moderate flow applications with standard Cv flow coefficient of 0.04
- Diaphragm sensing with nylon, PTFE, or stainless steel diaphragm
- Operating temperatures of -40° F to +350° F (-40° C to +176° C)
- Bubble-tight shutoff
- Inlet/outlet connections ¼" FNPT

Options

- Option Cv's available: 0.025, 0.005, 0.01
- · Panel mounting
- ¾" FNPT, AND10050–4, SAE J514 or MS33649 connections
- Monel® and Hastelloy® C body construction

Maximum Temperature & Control Pressures

Nylon Diaphragm Backing

	Maximum		
Seat Material	Temperature	@	Maximum Control Range
Tefzel®	175° F (80° C)	@	1,000 psig (6.89 MPa)
PTFE	175° F (80° C)	@	1,000 psig (6.89 MPa)
Polyimide	175° F (80° C)	@	2,000 psig (13.79 MPa)
PEEK™	175° F (80° C)	@	2,000 psig (13.79 MPa)

PTFE Diaphragm Backing

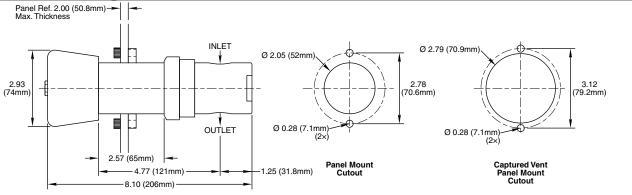
	Maximum		
Seat Material	Temperature	@	Maximum Control Range
Tefzel®	175° F (80° C)	@	2,000 psig (13.79 MPa)
PTFE	175° F (93° C)	@	2,000 psig (13.79 MPa)
Polyimide	350° F (176° C)	@	2,000 psig (13.79 MPa)
PEEK™	350° F (176° C)	@	2,000 psig (13.79 MPa)

Circle Seal Controls

How to Order

BP60 - 1 A 1 1 I 5 G 1 1 CAP ASSEMBLY **BODY MATERIALS**-1 Standard, aluminum 1 316L stainless steel 2 Brass 4 Panel mount, aluminum 4 Monel® 5 Captured vent, aluminum 6 Hastelloy® C DIAPHRAGM FACING/BACKING MATERIAL PORT CONFIGURATION Facing O-rings Actuator A Standard (one inlet & one outlet port) Nylon backing For more port configurations, see page 13. **1** SS SS Viton® PTFE SS 2 — PROCESS PORT TYPES-7 Inconel® Viton® Monel® 1 1/4" FNPT (1/4" FNPT gauge ports) (standard) 8 Inconel® PTFF Monel® 2 ¼" tube (¼" tube gauge ports) • Hastelloy® C PTFE Hastelloy® C **4** %" FNPT (1/4" FNPT gauge ports) A Hastelloy® C Viton® Hastelloy® C **7** AND10050–4 (¼" FNPT gauge ports) PTFE backing 8 SAE J514 (¼" FNPT gauge ports) Q SS PTFF SS **9** MS 33649 (1/4" FNPT gauge ports) **S** SS PTFE/Kalrez® SS (max. 450° F) SURFACE FINISH/DIAPHRAGM CAVITY T SS SS (max. 570° F) Kalrez® **1** < 25 Ra (standard) V Inconel® PTFE Monel® 5 < 25 Ra with 10-32 mounting holes W Hastelloy® C PTFE Hastelloy® C **ACTUATOR MATERIALS DIAPHRAGM TYPE** A Tefzel® 1 Standard **B** CF PTFE **CONTROL RANGE C** Polyimide **J** 0-500 psig I PTFE **K** 0–1,000 psig O PEEK™ L 0-2,000 psig FLOW COEFFICIENT (CV) **C** 0.025 E 0.04 (standard) 0.005 **J** 0.01

Outline & Mounting Dimensions



Tefzel® is a registered trademark of the DuPont Company.

Kalrez® and Viton® are registered trademarks of DuPont Dow Elastomers.

PEEK™ is a trademark of Victrex PLC.
Inconel® and Monel® are registered trademarks of Special Metals Corporation.
Hastelloy® is a registered trademark of Haynes International, Inc.

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G 0.09

BPR30 Series

Corrosion Resistant Back Pressure Regulator 160 to 2,500 psig



Features

- Positive shutoff at zero flow
- Compatible with corrosive or non-corrosive media
- Full range capability
- Unique design prevents clogging
- Tee handle for fast & precise control

Applications

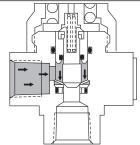
- Compressors
- · Pump bypass
- Hydrostatic testing
- Water descaling systems
- Pressure vessel protection
- Reverse osmosis systems

Technical Data

Body Construction Materials	Brass or 316 stainless steel
Seal Materials	Ethylene propylene, Neoprene, PTFE or Viton®
Seat Material	Kel-F®
Trim Material	Stainless steel exposed to line fluids
Port Sizes	1¼″ or ½″ NPT female
Weight	2.75 lbs
Pressure Ratings	160 to 2,500 psig (11 to 172 BAR)
Temperature Range	-65° F to +250° F (-54° C to +121° C)
Flow Capacity	Cv = 0.25

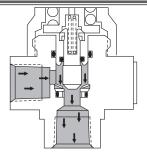
 $Note: Proper\ filtration\ is\ recommended\ to\ prevent\ damage\ to\ sealing\ surfaces.$

How it Works



Closed

With the unit spring load adjusted to the desired regulated "set" pressure, a deadtight seal if effected against the applied upstream pressure by the small seating spring contained within the poppet and spring retainer.



Regulating

When the upstream process pressure (acting on the regulating piston) increases, an opposing force is generated which, through the regulating piston, acts against the "set" spring load.

As the increasing upstream pressure level reaches the "set" pressure, the poppet is gradually lifted off its seat. A consequent decrease in upstream pressure is experienced when the flowing fluid is relieved to the downstream side of the poppet at a faster rate than the upstream pressure can supply.

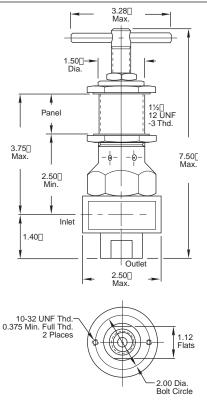
With decreasing upstream pressure, the spring force starts the poppet moving toward its closed position, thus maintaining the desired "set" pressure level within a narrow band.

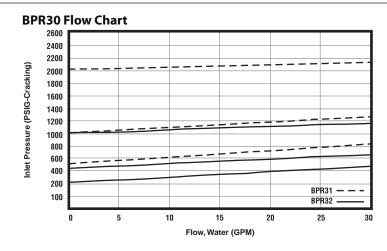
When the upstream pressure has decreased to a level just below "crack", the spring-loaded poppet again creates a tight seal against the sharp edge of the valve seat.

Circle Seal Controls

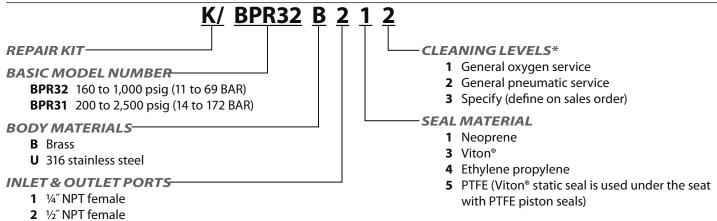
BP-3 Series

Dimensions & Flow Curves





How to Order



These units are not intended for applications where the exhaust connection will see buildup of downstream pressure. If this regulator is to be used in oxygen service, Vespel® SP-21 seat and Viton® seal are used and specify "General Oxygen Service" when ordering. Temperature range: -20° F to +250° F.

Viton® static seal is used under the seat with PTFE piston seals.

Please consult your Circle Seal Controls distributor, representative, or the factory for information on special connections, operating pressures and temperature ranges.

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Viton® is a registered trademark of DuPont Dow Elastomers. Kel-F® is a registered trademark of 3M Company.

BP-66 Series*

High Pressure Back Pressure Regulator (10,000 psig)



The BP-66 Series is the counterpart of the PR-57 pressure reducing series for systems that are higher in pressure and low to moderate flows. This regulator has piston sensing to provide relief at high pressures. The Polyimide/stainless steel assembly provides good shutoff in most applications. For economy purposes, the cap assembly and knob are of aluminum construction as in the PR-57 companion unit. Good sensitivity and a selection of control ranges make this regulator an excellent selection in many research and pilot plant facilities.

Maximum Temperature & Control Pressures

Seat Material	Maximum Temperature	@	Maximum Control Range
Polyimide	350° F (176° C)	@	10,000 psig (68.9 MPa)
PEEK™	350° F (176° C)	@	10,000 psig (68.9 MPa)

Features & Specifications

- 316L stainless steel construction
- Adjustable pressure control ranges of 0-2,000 psig, 0-4,000 psig, 0-6,000 psig, 0-7,500 psig, and 0-10,000 psig
- Spring-loaded piston sensor
- Gas and liquid service
- Cv flow coefficient: 0.04
- Operating temperature of -40° F to +350° F (-40° C to +176° C)
- 1/4" FNPT connections standard

Applications

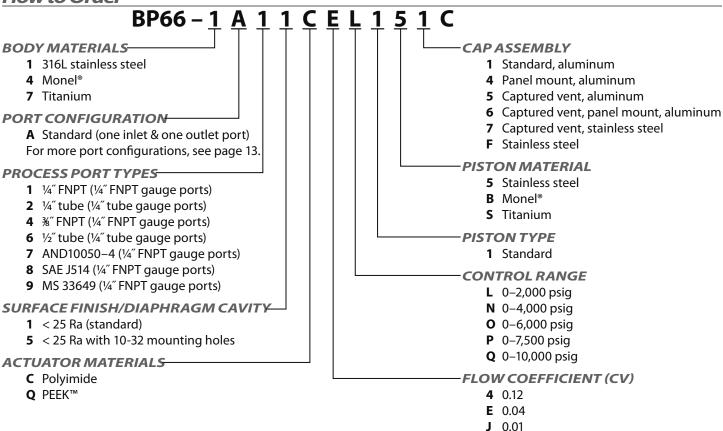
- Pilot plants
- Analytical instrumentation
- Compressors
- Pump bypass
- Pressure vessel protection
- Hydrostatic testing

Options

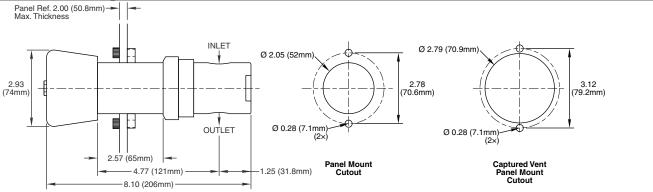
- Monel® and titanium body construction
- Optional Cv's: 0.01 and 0.12
- Panel mounting
- AND10050-4, SAE J514, MS 33649, or %" FNPT connections

^{*} Replaces the BPR1xA Series.

How to Order



Outline & Mounting Dimensions



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BPR21 Series

High Flow Dome-loaded Back Pressure Regulator 25–6,000 psig



Features

- Extremely reliable
- High flow capacity
- Remote control capability
- Large diaphragm provides accuracy & sensitivity
- Compatible with most liquids & gases

Applications

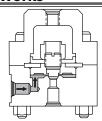
- System bypass valve
- Pressure vessel protection
- Chemical/petroleum plants
- Industrial controls
- Pumps or compressors
- Heat exchangers

Technical Data

Body Construction Materials	Brass or 316 stainless steel
Seat Materials	Hastelloy® C, Kel-F®, KYNAR®, Nylatron®,
	Polyimide, stainless steel, or Vespel® SP-21
Port Sizes	¼″ NPT female, ¾″ NPT female,
	AND10050-4 or AND10050-6
Pressure Ratings	Brass: 25 to 3,500 psig (1.7 to 241 BAR)
	Stainless steel: 25 to 6,000 psig (1.7 to 414 BAR)
Temperature Range	-65° F to +400° F (-54° C to +204° C)
Flow Capacity	Cv = 0.90
	Orifice diameter = 0.23"

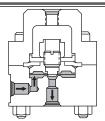
Note: Proper filtration is recommended to prevent damage to sealing surfaces.

How it Works



Closed

With a pressure regulator connected to the dome port and the dome pressure adjusted slightly above the desired regulated "set" pressure, a bubble-tight seal is effected against the applied upstream pressure.



Regulating

When the upstream process pressure (applied to the inlet side of the diaphragm) increases, an opposing force is generated which acts on the diaphragm and attached poppet against the "set" pressure load in the dome.

As the increasing upstream pressure level reaches the "set" pressure, the poppet is gradually lifted off its seat. A consequent decrease in upstream pressure is experienced when the flowing fluid is relieved to the downstream side of the poppet at a faster rate than the upstream pressure can supply.

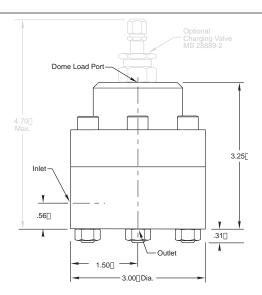
With decreasing upstream pressure, the pressure-loaded dome starts moving the poppet toward its closed position, thus maintaining the desired "set" pressure level within a narrow band.

When the upstream pressure has decreased to a level just below "crack" the generated forces from the pressure-loaded dome again create a tight seal between the poppet and the sharp edge of the valve seat.

Circle Seal Controls

BPR 21 Series

Dimensions

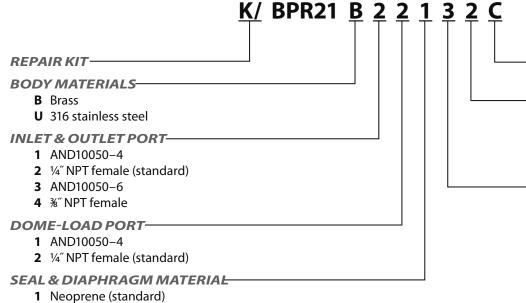


How to Order

3 Viton®**

4 Buna N

PTFE o-ring



- OPTIONS

C Charging valve

CLEANING LEVELS

- 1 General oxygen service*
- **2** General pneumatic service
- 3 Specify***
- 4 Precision pneumatic service

SEAT MATERIAL

- 1 Nylatron® (standard)
- 2 Kel-F[®] (limited to 3,600 psig)
- 3 KYNAR®
- 4 Stainless steel
- 5 Polyimide (Vespel® SP-21)**
- 7 Hastelloy® C
- * If this regulator is to be used in oxygen service, specify "OXYGEN SERVICE" when ordering or furnish a copy of the special requirements.
- ** Standard for oxygen service (Vespel® seat and Viton® seal & diaphragm).
 Temperature range: -20° F to +250° F
- *** List requirements or furnish the factory a copy of the requirements or specifications

Performance characteristics: Repeatability of cracking (set) pressure: ±2% Crack pressure to full flow: 110% of set pressure

Reseat pressure: within 2% of set pressure above 400 psig.

5 PTFE-coated Neoprene diaphragm,

CAUTION: These units are not intended for applications where the exhaust connection will see a buildup of downstream pressure.

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Kel-F® is a registered trademark of 3M Company.
KYNAR® is a registered trademark of ATOFINA Chemicals, Inc.
Nylatron® is a registered trademark of DSM Engineering Plastic Products.
Vespel® is a registered trademark of E.I. du Pont de Nemours and Company.
Viton® is a registered trademark of DuPont Dow Elastomers.

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CIRCOR Instrumentation Technologies (CIT) is the logical choice for fluid control solutions. We provide the lowest cost of ownership, offering the best in class reliability and availability of our products. We have global coverage, delivering value in the form of local, flexible service to meet our customer's needs. CIT is a product group specializing in instrumentation with orifice sizes typically up to 2".

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